

The influence of different potassium fertilization on the content in pea (*Pisum sativum* L.) and soil on the copper and iron

Wpływ zróżnicowanego nawożenia potasem na zawartość miedzi i żelaza w grochu siewnym (*Pisum sativum* L.) i w glebie

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Copper and iron are trace elements necessary for the growth and development of plants and animals. These are elements antagonist potassium. The conditions of use of increased doses of the low-potassium fertilizers in the soil available potassium, it is necessary to monitor the concentration of these elements due to the possibility of a deficiency.

The aim of the study was to determine changes in the content of copper and iron in the pea seed (*Pisum sativum* L.) and in the soil under the influence of different doses of potassium fertilizers.

The field experiment was conducted in 2010 and 2012 using completely random with four replications on the experimental plots of the University of Natural Sciences and Humanities in Siedlce. The experiment was conducted on soil with a neutral pH. Soil granulometric composition of loamy sand characterized by low abundance in available potassium. The study included seven levels of fertilizing: without fertilization; N; NK₁, NK₂, NK₃, NK₄; NK₅. Nitrogen was used at a dose of 20 kg ha⁻¹ in the form of ammonium nitrate. Potassium fertilizers were used in doses: K₂ – 41.5; K₂ – 83; K₃ – 124; K₄ – 166; K₅ – 207.5 kg ha⁻¹ in the form of a potassium salt 60%. Not used phosphorus fertilization, because the soil was characterized by very high abundance of available phosphorus.

The plant test after harvest of the plots dried. Separate the seeds, straw, husks and roots, and then the average of the sample obtained milled. Soil samples were dried and pounded in a mortar and sieved through a sieve with aperture of 2 mm. Copper and iron in the test plant, and the total content of the soil was determined by the ICP emission spectrometer with inductively excitable plasma. The results were analyzed statistically using two-way analysis of variance (ANOVA), and significant differences were determined using Tukey's test at p = 0.05.

Varied doses of potassium significantly influenced the changes in the content of copper and iron in the pea seed and soil. The applied doses of potassium K₃ – 124; K₄ – 166; K₅ – 207.5 kg ha⁻¹ significantly decreased copper content in the seed and pea roots, while in the straw and husks significant reduction occurred at a dose of K₅ – 207.5 kg ha⁻¹. The iron content was significantly reduced in the seed and the roots of pea under the influence of potassium fertilization dose K₅ – 207.5 kg ha⁻¹, at a dose husks K₄ – 166 kg ha⁻¹ and the straw under the influence of potassium fertilization in a dose K₃ – 124 kg ha⁻¹. Potassium fertilization significantly differentiated the content of copper and iron in the soil in the subsequent sampling dates during the growing season. The highest total content of iron and copper were determined in soil samples collected at the end of the growing season. Potassium fertilization K₄ – 166 kg ha⁻¹ significantly influenced the increase in the content of copper and iron in the soil in all analyzed soil sampling dates. Assay of copper and iron in the dry matter of seeds, straw and husks pea was located below the range limit numbers specifying the permissible amounts of these elements.